Total No. of printed pages = 4

MCA 202102

Roll No. of candidate | | | | | | | | | | |

22/3) **2021**

M.C.A. 1st Semester End-Term Examination

DESIGN AND ANALYSIS OF ALGORITHMS

(New Regulation & New Syllabus)

Full Marks – 70 Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *four* from the rest.

1. Choose the appropriate answer : $(10 \times 1 = 10)$

(i) The worst case time complexity of an algorithm is represented by

(a) Big Omega Notation

(b) Big Oh Notation

(c) Theta Notation

(d) None of the above

(ii) In linear search worst case occurs

(a) When Item is somewhere in the middle of the array

(b) When Item is not in the array at all

(c) When Item is the last element in the array

(d) When Item is the last element in the array or is not there at all.

(iii) The minimum number of element in a heap of height h is

(a) 2^h (b) 2^{h+1}

(c) 2^{h-1} (d) None of the above

(iv) Which of the following statement is true for a Divide and conquer algorithm

(a) The sub problems are solved only once

(b) The sub problems are solved non recursively

(c) The sub problems are solved only once recursively

(d) The sub problems are solved repeatedly and recursively

(v) Time complexity of matrix chain multiplication problem is

(a) $O(n^2)$ (b) $O(n^3)$

(c) O(n) (d) None of the above

(vi) Which of the following problem has an optimal greedy solution?

(a) O-1 knapsack problem

(b) Fractional knapsack problem

(c) Tower of Hanoi problem

(d) None of the above

(vii) The running time of an algorithm is given by

(a) Total number of basic operations performed by the algorithm

(b) Total number of statements

(c) Maximum time taken to execute

(d) None of the above

(viii) The running time of quick sort depends on the

(a) No of input (b) Arrangement of element

(c) Partioning element (d) None of the above

(ix) Consider the strings "PQRSTPQRS" and "PRA TPBRQRPS". What is the length of the longest common subsequence?

(a) 9 (b) 8

(c) 7 (d) 6

(x) A binomial tree B_k contains

(a) 2^k nodes (b) 2^{k-1}

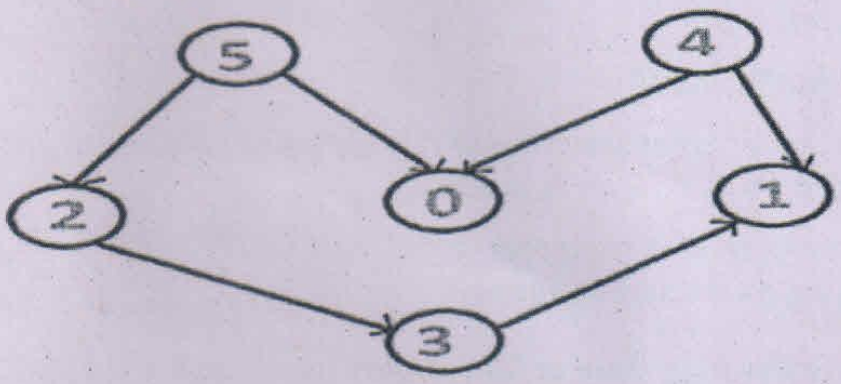
(c) 2^{k+1} (d) None of the above

(b) Explain the best case, worst case and average case running time of Quick sort. Show that the average case running time is much closer to the best case than to the worst case. (8)

5. (a) Construct the Huffman code of the characters in a data file of 100000 characters for the following set of frequencies (in thousands) A:45 b:13 c:12 d:16 e:9 f:5 (10)

(b) What are the minimum and maximum numbers of elements in a heap of height h. (5)

6. (a) What is topological sorting? Apply topological sorting on the following graph (2+5=7)



(b) Define a flow network. Explain about the properties of a flow network. (2+6=8)

7. (a) Show that 0-1 knapsack problem doesn't have a greedy solution but fractional knapsack has a greedy solution. (8)

(b) Illustrate the operation of COUNTING SORT on the array $A=\{6, 0, 2, 0, 1, 3, 4, 6, 1, 3, 2\}$. (7)